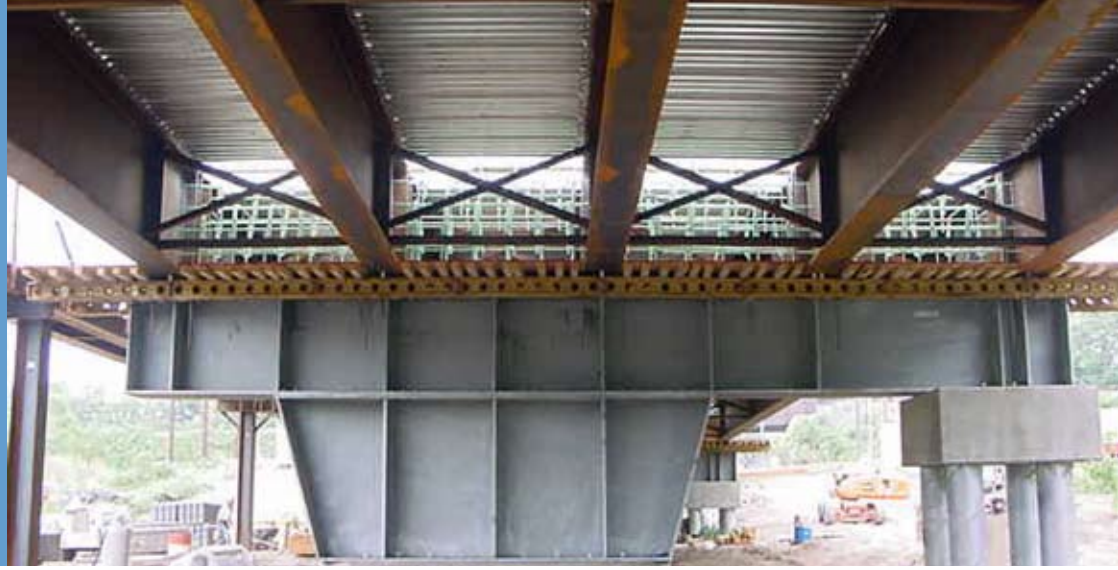


A view of the new Scioto River bridge in Circleville. ODOT set a goal of closing the span to traffic for just 60 days, but due to the use of prefabricated materials and contractual incentives, crews completed their work in just 48 days.

OHIO Ohio Builds Bridge to Faster, Smarter, Better Construction

ASSEMBLING A TOOLBOX OF INNOVATIVE SOLUTIONS

When Ohio Department of Transportation (ODOT) bridge engineers set out to create a unique toolbox of techniques for bridge construction, their efforts reflected the principles of the Federal Highway Administration (FHWA) Highways for LIFE program: build safer, better highways with faster, more cost-effective delivery. ODOT has now adopted a set of tools that have cut construction time by more than half on several bridge projects. All are captured in a strategic initiative called "Build Bridges Faster, Smarter, Better."

Bridge Backups

With the Nation's 10th largest highway network, fifth largest volume of traffic, fourth largest Interstate network, and fourth largest number of freight shipments, construction on Ohio roads significantly impacts highway users.

One element that literally stands in the way of rapid roadway construction is clear: Ohio's inventory of bridges. The State's 42,000 bridges (the second largest inventory in the United States) are made of eight different types of main span materials: concrete, pre-stressed concrete, steel, timber, stone, aluminum, cast iron, and wrought iron. No two are exactly alike.

Bridge replacement and repair is a consistent challenge in terms of accelerating project delivery; Ohio motorists have logged many frustrating hours slowly making their way through bridge construction projects.

Tools of Choice

Ohio's solution is a customer-focused initiative christened "Build Bridges Faster, Smarter, Better."

ODOT canvassed the country looking for the best ways to accelerate bridge construction, pursuing Highways for LIFE objectives like improving safety before and after construction, reducing congestion caused by construction and improving the quality of highway infrastructure. The ODOT team quickly learned that inventive techniques were proliferating around the country.

The team started testing a range of practices, hoping to fill its toolbox with potentially high-payoff techniques like prefabrication of structures, precast deck panels, stay-in-place forms, high performance materials, rapid weekend overlays, expedited construction times, design/build delivery systems, and contractual time constraints.

Example: Rapid Weekend Overlays

As Ohio tested its new tools, specific successes emerged. In the congested Cleveland and Cincinnati areas, rapid weekend overlays became the tool of choice for bridge deck projects. ODOT closed traffic on major Interstate routes after the Friday evening rush hour and reopened the roadways before the Monday morning rush, allowing construction crews to work uninterrupted through the weekend. Aggressive public information campaigns kept drivers well informed of the closures. Time after time, drivers were willing to trade the inconvenience of a total closure for a reduced window of disruption.

The Circleville Bridge: a "How To"

Several other pilot projects were tested using the ODOT "Build Bridges Faster, Smarter, Better" toolbox. When a bridge over the Scioto River in Circleville needed repair, ODOT put its newfound resources to the test. Conditions at the bridge included frozen rockers, deteriorating pier caps and badly rusted girders and sidewalks. Environmental concerns were also a factor as regulations did not allow work in the river. Traditional methods would have required 12 to 18 months of active construction, but the ODOT team set – and reached – a goal of reducing onsite bridge construction to 60 days. To address environmental concerns, crews built a ranger on site in order to drive pilings in the river. Crews also worked from a man-basket to avoid putting any equipment in the water. Demolition work was performed in sections with a crane reaching across the waterway to remove wings.

After demolition, beam seats were poured on top of the existing footers. Durable grout material was used for fill and repair. To reduce idle time while waiting for pier caps to be placed, crews set beams on a shoring tower, expediting construction.

Teams also used a variety of prefabricated materials to reduce downtime. Disk-tron bearing pads arrived onsite labeled for specific beam lines and directions. Steel pier caps were pre-fabricated. With traffic removed, the existing bridge became a working platform. Stay-in-place metal forms were used on decks, eliminating the time that would be needed to remove wooden forms. The durability of the bridge was strengthened by using diaphragms rather than beam splices. As the bridge neared completion, crews noticed a gap between the existing stem and new pier caps. An epoxy injection was used to fill the void.

Creative thinking continued to fuel the project as crews placed reinforcing steel for the barrier wall immediately after pouring concrete in order to save the time required to drill holes after the material had cured. Finally, a new combination cure and sealant was tested by ODOT and Chem-Master. The product not only turned a two step process into one, but also carried a three-year guarantee.

A contractor incentive/disincentive program was developed to further speed the project. The contractor was rewarded or fined $50,000 for every day of early or late completion. As a result, the Circleville bridge was delivered with no "rain days," despite major rainfall during the project that resulted in some minor flooding.

The diverse menu of innovative solutions allowed the Scioto River bridge repair to be completed in record time. Despite its initial goal of reducing the bridge closure time to 60 days, the ODOT crew surpassed all expectations, finishing the project in just 48 days. The result was a bridge constructed to the highest quality standards in record time, with minimal disruption to the traveling public.

Other Successes

Similar success was enjoyed by other projects piloted under the "Build Bridges Faster, Smarter, Better" program. A bridge over Leatherwood Creek was replaced in just 15 days thanks to innovative, post-tensioned modular slabs and approach slabs, as well as a contractual incentive of $5,000 per day.

Another success was a three-span slab bridge over Lytle Creek that was replaced with a single span box beam bridge that included an integral deck precast into the beam.

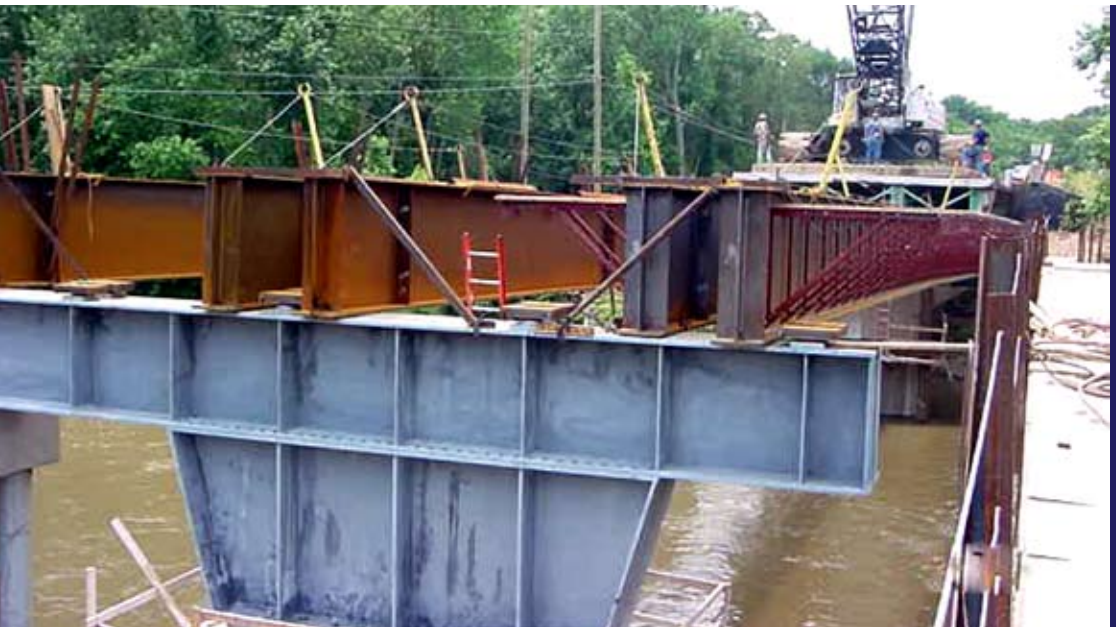
In all, the "Build Bridges Faster, Smarter, Better" program sliced construction time by more than half on six pilot projects.

Lessons Learned: Changing Attitudes, New Thinking

A handyman who leaves the home improvement center with a new tool knows the anticipation that accompanies the purchase. He can't wait to try it out. The same was true for engineers at ODOT as they tackled the "Build Bridges Faster, Smarter, Better" initiative.

Before applying new techniques, however, ODOT experts had to take an entirely new approach to construction projects. Tim Keller, Ohio State Bridge Engineer, says the most important piece of advice he would give to other agencies considering a similar program is, "Concentrate on the entire project. When ODOT started out, we concentrated on the bridges and should have spent more time with the total construction project. This helps answer the very difficult questions of which bridges should be accelerated, how fast the construction should be accelerated, and how much additional cost should be borne to accelerate."

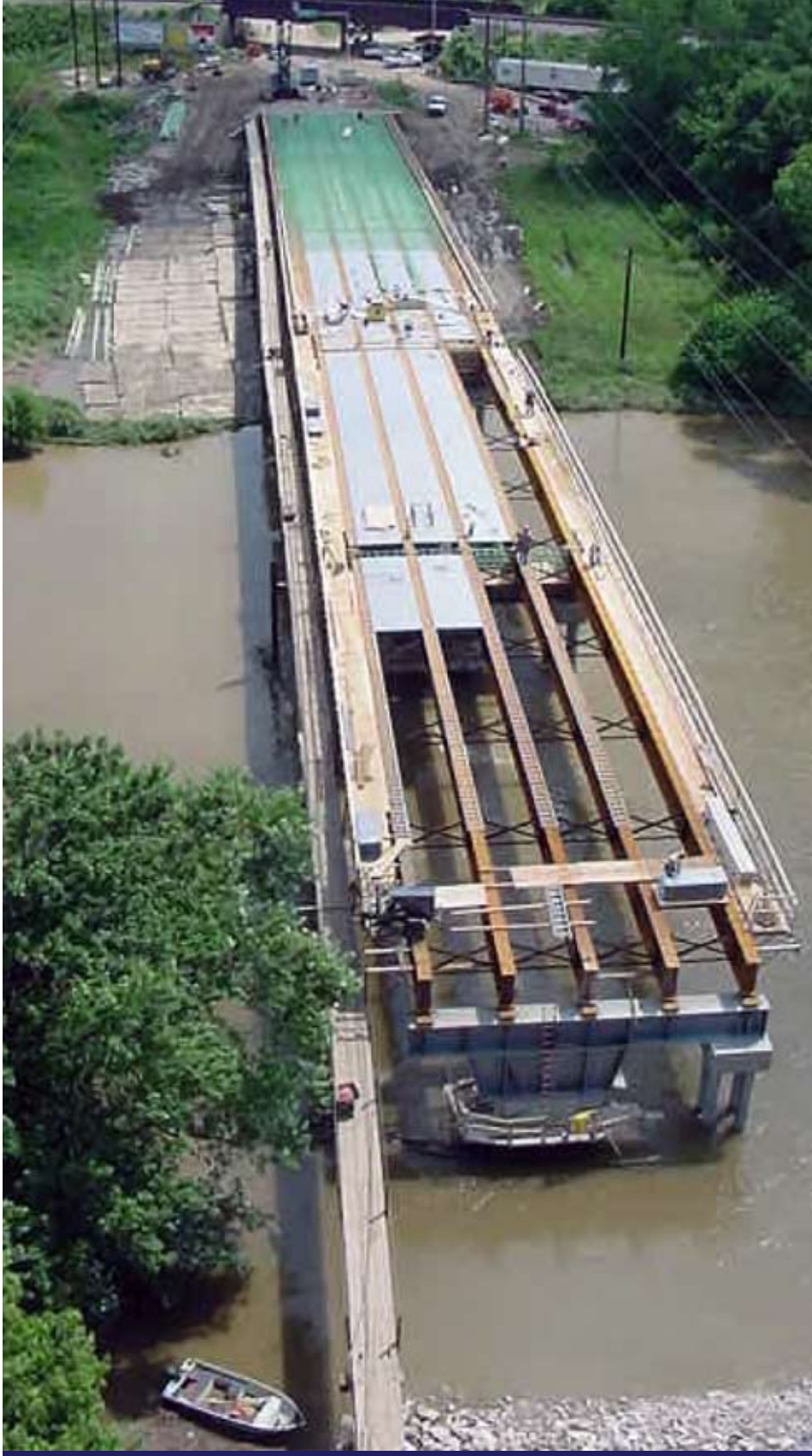
In order to help a team engage its thinking around an entire project before delving in, ODOT introduced a new process early in the design phase called a Maintenance of Traffic Alternatives Assessment (MOTAA). The MOTAA includes a phasing plan that shows how the designer envisions the project to be constructed, as well as lane configurations in each phase. The MOTAA helps determine which bridges should be accelerated and how fast construction should be paced.



To expedite construction, crews set beams on a shoring tower until pre-fabricated steel pier caps were placed.

Keller says, "If a phase will take 60 days, then the bridge should be designed so that it can be built in 60 days. We would waste resources if we built the bridge in 30 days and let it sit idle for 30 days. In the same vein, if a phase is going to last 60 days, don't design a bridge that will take 90 days to build. We may take three years on a project, and two of those will be pre-planning and building parts of a bridge ahead of time so that the impact to the commuter is much shorter. We plan ahead so we can go in and do what we need to do as quickly as possible."

Another practice that has been invaluable to the ODOT team has been the establishment of permitted lane closure maps for the entire interstate system. These maps show when a lane can be taken. In some cases, a lane can only be taken at night due to capacity issues. Exceptions to these closures can only be approved by executive leadership. The phasing of a project must meet the permitted lane closure maps, curbing negative impacts on the traveling public and boosting mobility.



An aerial view of the bridge replacement project over the Scioto River. ODOT used techniques assembled in its "Build Bridges Faster, Smarter, Better" toolbox to dramatically reduce construction time on this river crossing.

Finally, ODOT's process keeps the issue of cost squarely in view. User costs are developed and decisions made about accelerated construction based on the additional outlay necessary to maintain traffic. While accelerated construction does sometimes come at a higher price, Matt Shamis, Bridge Engineer with the Federal Highway Administration Ohio Division, notes that cost is balanced by time saved and penalties reduced to the customer. Shamis says, "We realized that minimizing disruption to the traveling public was worth the extra cost because in the end, the savings ends up in the pockets of the traveling public."

Keller explains the ODOT theory of faster bridge construction this way: "The technology to accelerate bridge construction is evolving and moving forward. What is lacking are discussions on which bridges need to be accelerated, how fast to accelerate, and how much to spend to accelerate. At ODOT, we have addressed these issues through a new process (MOTAA) early on in the design phase. After these decisions are made, then we can go about designing a bridge that can meet the established criteria."

Change for the Better

What started as an attempt to reduce construction time on bridges has now become a way of doing business for ODOT. Engineers not only have at their fingertips a toolbox stocked with trailblazing techniques proven to minimize traffic delays during construction, but they can also employ a new approach to innovation thanks to MOTAA. As ODOT continues to update its roadways and increase capacity in urban corridors, portions of the "Build Bridges Faster, Smarter, Better" program are continually put to use.

Drivers on Ohio roads continue to encounter a wealth of attractive and impressive bridge crossings. But the chance of getting a close-up view of repairs while stuck in construction traffic is greatly reduced, thanks to the bold thinking of ODOT leaders through the "Build Bridges Faster, Smarter, Better" initiative.